

PATHWAYS

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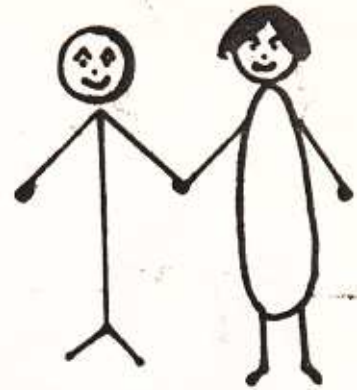
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THE TENS FAMILY

Mr. Ten is long and slender. Mrs. Ten is round and fat. They always go around together like this.



They have eleven children. Nine is a grown up girl.

and she looks after One, who is a little boy.



There are many other Tens families, just as there are many Sharma and Gupta families. So Mr. Ten who lives in a two-room flat insists that the children go out in pairs like this—9 with 1 8 with 2; 7 with 3; 6 with 4; and the twins 5 always stay together. That way everyone will know that they belong to Mr. and Mrs. Ten of the 2-room flat. Baby Zero stays at home with his parents.

Another family also by the name of Ten live in a three-roomed flat and this father insists his children go out in threes. Thus :

1 goes with 7 and 2

3 goes with 6 and 1

4 goes with 5 and 1

8 goes with 2 and baby zero

9 goes with 1 and baby zero

This family doesn't have Twin 5's as you can see and the little one gets taken around quite a lot.

There are other Tens families. I'll tell you all about them next time—but you will be interested to hear that one family has ten little Ones and a baby Zero

Do you know of any Tens family ?

Mrs. Patricia Beddoe

BIG AND SMALL

Little children use the words "big" and "small" to mean a variety of things. They express many concepts which children form at the pre-primary or early primary stage. For example they could refer to :

1. **Length, Width** (horizontal)
(long/short; wide/narrow)
2. **Height** (vertical)
(tall/short; long/short)
3. **Area** (big/small)
4. **Capacity** (more/less; big/small)
5. **Age** (old/young)
6. **Weight** (heavy/light)
7. **Size** (fat/thin)
8. **Change and Growth** (changes in capacity, age etc.)
9. **Comparisons and Sequence** (big/bigger/biggest ; small/smaller/smallest, big/smaller; small/bigger—that is ascending & descending order.)

The words given in brackets suggest alternative vocabulary which the children should develop.

It is interesting to note that most of these terms re-appear in later years as mathematical or scientific terms. However they are certainly a part of every child's vocabulary and teachers can help the children form clear concepts through a series of simple activities based on materials which are available in the environment. Some suggestions for such activities are given below. While formal exercises involving accurate measurements will be done in later years, these activities will involve children in handling objects, observing and exploring. Discussion must follow every activity. Ask questions, introduce the new words and extend each idea to other situations familiar to the children.

1. a) Measurement with string—use common objects like books, tables, windows, pencils.....
- b) Measure bigger objects with non-standard units e.g. a short, straight stick a handspan, a foot.....
- c) Use strips of newspaper to measure length, width, height—of persons and objects.
- d) Arrange the newspaper strips in ascending order just as you stand "in line for assembly". Who is the shortest? the tallest? Name people on either side of you. Name one person taller/shorter than you.
- e) **Problem Solving**—how would you use string or a strip of paper to find how big a ball is?
- f) Point to objects having specified characteristics e.g. taller than Meena, wider than your hand etc.

Skills : Making measurements comparing, using new vocabulary in sentences (spoken/written), observation, names of objects, arranging in order, problem solving, motor skills.

2. a) Draw outlines of leaves, palms, soles of feet etc., on squared paper from a maths book. Compare the number of complete squares covered by each. This leads to early concepts of "area".
- b) Outline these objects on coloured paper—cut out and compare by placing one on top of the other. Arrange in order. Make into a booklet having pages of increasing size.

Skills : Cutting out, comparison, outlining, counting.

3. a) How many mugs of water can be filled from a given bucket? If you use a smaller mug? If you use a bigger mug? Which mug holds more? Does a mug hold more, or does a bucket?

b) Measure capacity using milk bottles (standard unit—litre) tea-cups, glasses as well.

c) Arrange a collection of given bottles according to their capacity—given water and the bottles only.

4. Experiments with a Balance ('Tarazu')

a) Compare common objects. Which is heavier? lighter?

b) How many small identical objects (e.g. buttons or beads) is equal in weight to one large object (e.g. a small stone)?

c) How many potatoes/onions did your mother obtain in 1 kg? First guess, then check.

Skills: Balancing things (The balance can be a hanging or table top variety), counting, enquiry/observation, estimation.

5. a) Compare people in many ways—age, fat/thin; tall/short.

b) Compare personal measurements with each other—e.g. height, handspan, foot, palm etc.

6. Try exercise 1f for other characteristics also.

7. Look at objects that change in size e.g. a burning candle, a tender leaf, an ice cream, a balloon, a baby, a pencil.

8. Far-away objects look small (eg. an aeroplane, a car), while nearby objects look big. Observe these things. Draw them. Name them.

Testing

Teachers might well ask, "How do we test? How will we know if the concept has been grasped?" All testing need not be written. To record results of oral testing, you will obviously need a checklist which spells out each concept

and gives a list of the students' names. Put a tick in the column if the child answers your questions correctly. For non-verbal tests, use your imagination, tell them to draw, paint, point out objects, carry out your instructions and so on. Here are a few suggestions.

1. **Use pictures**—ask children to point to appropriate object (if test is oral)

—ask children to write single words below pictures, as required.

—ask children to colour in correct pictures.

2. **Use objects**—ask children to find an object with the required characteristic e.g. Find something long which is wider than your shoelace.

3. **Questions** : (oral) which pencil would you like—a short one or a long one? This can be done by showing objects also.

4. **Ask children to draw pictures**—e.g. a tall tree.

5. **Written questions**—True/false; fill up blanks, simple sentences.

The environment provides opportunities for learning in exciting ways. Simple activities of this kind can be used to develop several skills in the children.

1. Communication Skills

- * language
- * mathematics
- * creative self-expression

2. Learning Skills

- * Observation
- * Collection and classification
- * Learning by Doing
- * Enquiry (asking questions)—of people
- * Looking for information in books.
- * Recording Skills—in pictorial form.

3. Social Skills

- * for inter-personal relations
- * for preservation and appreciation of the environment.

An added bonus—each activity leads to many skills!

LIFE IN THE SEA

—A Lesson Plan

I would like to share with readers a plan that I worked out on this topic, for children aged nine/ten years. We had just concluded a workshop on learning objectives which helped me spell out in fair detail, what I wanted to achieve through this set of lessons. In order to extend the learning beyond the confines of the science textbook, I decided to use the environmental studies approach and link it up with a variety of other subjects and skills. This led to the development of the web chart given here. The next step was to plan a series of activities which the children could carry out and finally to think about ways of testing.

Having actually tried it with my students in class IV, I was happy to find a positive response from the children. The encouraging feed-back gives me the incentive to try my hand at it again.

Here are the objectives that I started out with.

OBJECTIVES

1. The child will be able to name and classify sea fish.
2. The child will be able to list 30 sea animals.
3. The child will be able to describe a pomfret, a sea horse and a jelly fish by writing a paragraph in his/her own words.
4. The child will be able to name the sea fish which provide food for people living in coastal areas.
5. The child will be able to write in his own words one page about the effects of pollution on sea water.
6. The child will be able to make a map showing the route from the classroom to the aquarium.
7. The child will be able to collect articles from newspapers and magazines about the pollution of sea water.
8. The child will be able to collect information about whale fishing, the number of whales

left in the Pacific and Atlantic oceans from "Under Water Life" and "The Sea"—books found in their library.

9. The child will be able to make a mobile of fish as part of craft activities.
10. The child will be able to compose a short poem on fish using his/her imagination.
11. The child will be able to answer questions about the flora and fauna of sea.

Here is the web chart—a content outline.

LIFE IN THE SEA

1. Sea Creatures

- i. Plankton (microscopic animals)
- ii. Larger animals
 - their names and appearance—colour, size and shape—their habits
 - defence mechanisms
 - the food-chain

2. Protecting the Sea From Pollution

- Poisonous wastes from industry
- Wastes from ships
- Back waters

3. The Sea In Literature, Art And Culture

- Religions and festivals
- The Signs of the Zodiac—Cancer and Pisces
- Superstitions
- Visits to the Aquarium and the Zoology Department to see the Sea Museum
- Fish motifs in decoration

4. Fishing as an Industry

- The food of people in coastal areas—integration with geography.
- Frozen sea food/export and trade
- Medicines/perfumes.
- Conservation—saving the whale.

POSSIBLE ACTIVITIES AND SKILLS

The Basic Skills

1. **Factual writing:** the names of sea animals and plants—simple descriptions, their habits, structures, shapes, sizes and colours. Answering simple questions.

2. **Mathematics:** The price of fish per kilogram. Story problems involving multiplication and division.

The Study Skills

Observation: A study of the School aquarium—a visit to the zoology department to see the Sea Museum.

Recording & Classification: Making charts—tabulating (information collected under classified headings—graphs of edible sea fish and other sea animals found in coastal areas of the world (integrating geography).

Close observation and recording of the movements/habits of fish in the school aquarium for one week.

Mapping: drawing a map to show the route from the classroom to school aquarium.

The Use of Reference Material: Books, atlases showing coastal areas, newspapers and magazines giving information about pollution of the seas.

Creative and Imaginative Activities: Writing poems in Hindi and English on 'Fish' (integration with language studies)—'kolam' from S. India—using 'fish' patterns.

Here are some samples of the activity cards, I gave the children:

Activity 1

1. Collect articles from newspapers and magazines about the pollution of sea water

pollution. Write a paragraph of about 150 words touching on the following points:

- a. The causes of sea-water pollution.
- b. How does it affect animals and in what way is man affected by it.
- c. Give your suggestions to prevent it.
- d. Find out from the book (The Sea) how much oil is being dumped in the Oceans annually.
- e. Which part of the United state and Japan have suffered with the serious effects of mercury poisoning. (The Sea)

Activity 2:

In your library period read "Under Water Life" and "The Sea". Note down—

- a. The names of 30 sea animals.
- b. Their special behaviour and structure.
- c. What do you understand by the term "Oviparous", "Viviparous" fish?
- d. Why is it feared that a day will come when whales will become extinct?
- e. From which part of the whale are vitamins extracted?
- f. What is extracted from the bladder of a blue whale?
- g. How many blue whales are left in the Pacific and Atlantic ocean?

Activity 3

Draw a route map from your class room to the aquarium. Write your scale.

Activity 4.

Make a mobile of fish, using coloured paper.

Finally here are some questions which were set after we had completed the topic.

I. Choose the odd one out.

- i) Plant, leaf, algae, sponge.
- ii) Sargassum sea weed, fucus seaweed, carpus sea weed, coral.
- iii) Jelly fish, star fish, brain, pomfret.
- iv) Sea fan coral, brain coral, mushroom coral, lobster.
- v) Striped sea anemone, red sea anemone, green sea anemone, polyp.

II. Match the following :

A	B
i) Planktons	a) live among sea weeds.
ii) Lobsters	b) in groups or colonies.
iii) Starfish and sea anemones	c) looks like an umbrella.
iv) Sponges live	d) travel in shoals.
v) The upper part of a jelly fish	e) are tiny animals and plants floating about on or near the surface of water.
vi) Sea urchins are	f) gray and purple in colour.
vii) Tuna fish	g) live in cracks or gaps in rocks in the sea.

III. Fill in the blanks to complete the following paragraphs.

- a)are small silvery fish. They travel in large shoals. They feed on..... The bodies of herrings are.....and.....from sides. The side fins lie on the.....of the body and are behind the gill covers. Directly below the top fin on their belly lies a pair of.....
There is another bottom fin near the.....
The tail of herring is.....
- b) I am a pomfret. I like to swim with my friends near.....in.....water. I'm..... in colour. I like to

eat..... I'm.....in shape and flattened on sides. My..... is rounded. The.....and lower fins point backwards. The.....is long and pointed. My.....is forked and the stump is very narrow. I have small scales.

IV. Compose a short poem on a fish :

V. Unscramble the scrambled words

1. EERLCAMK
2. RKHAS
3. UATN
4. RREIHGN
5. ERTFMOP
6. HSSERA OES
7. HICSNUASER
8. SHSATRIF
9. ABRHECARIMTS

VI. Uncode the hidden message. Always go in a straight line-forward, vertically, horizontally, even backwards. Start at 'S' in the top row and end at 'N' just next to it.

T	S	N	O	I	T	C
V	A	S	P	R	B	N
E	W	H	V	X	T	I
W	X	A	X	E	U	V
T	E	L	L	M	W	X
K	S	F	R	O	Y	Z

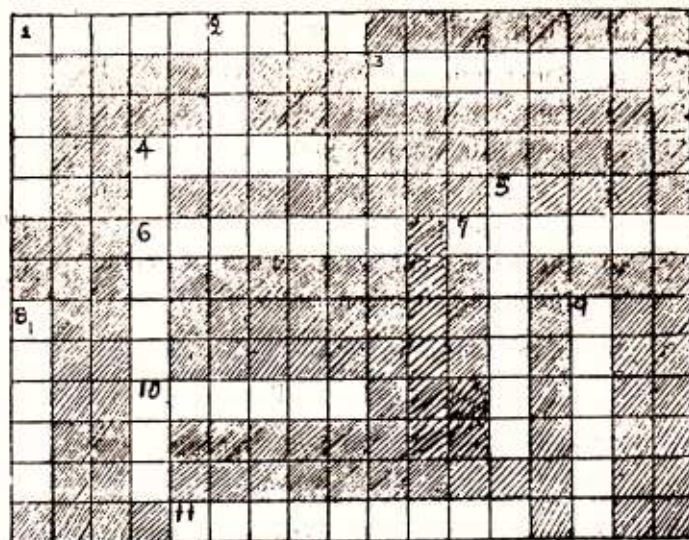
VII. A Cross word puzzle. Here are the clues.

DOWN

1. They are soft and slimy, sea anemones—an example of this type.....
2. They are fish, oval in shape found in deep sea waters.
4. I'm an urchin but I live in the sea.
5. I'm very tasty to eat, people like to have me with Chinese food.
8. Save me from extinction.
9. Sea weeds do not grow from seeds or spores. They grow from small cells called.....

ACROSS

1. Many tiny animals and plants float about on or near the surface of water known as.....
3. They are very common in the sea near Bombay.
4. They are killers in the sea.
6. They are large polyps.
7. They are hard stony skeletons fixed to the sea bed or rocks.
10. People do not ride me because I live in the sea.
11. My other name is Portugese Man of War.



—Anjali Roy Chowdhury
Maharaja Sawai Man Singh
Vidyalaya, Jaipur

MOTIVATION

One of the essential conditions for effective learning has to do with motivation. Sometimes teaching is conducted against a background of lack of motivation, but since it is certain that little effective learning takes place when motivation is poor, it is vital that the teacher should do everything possible to promote good, strong motivation and do nothing that might inhibit it.

Some powerful sources of motivation are already present in the situation and do not derive from the teacher; motives that spring to mind are, for instance, the desire to reach a given standard, perhaps to pass some examination or test, or to gain a qualification leading to an advantageous position or career. Again individuals vary as to what acts as an incentive to learning in their particular case: some people are driven to excel, they are keen to be good at whatever they turn their hand to; for them it is a matter of personal pride and self-esteem, which would suffer if they were to permit themselves to fall short of the highest standard, or of the standard they know themselves to be capable of. Others feel the urge to do better than their fellows; in them the competitive spirit is strong, they obtain their personal satisfaction from the sense of their relative superiority, and the recognition by others of that superiority. Others again are appreciative of approval, whether from their fellows or from higher authority; they are discouraged if approval is withheld, resentful should disapproval be incurred. Most of us experience all these feelings at different times and in varying degree.

Those who seem to have no strong incentive can be a problem to their teachers, whose task it will be to look for all possible means to stimulate their interest and a desire to learn. By treating learners as individuals a teacher will in time get to know what each is like, what he responds favourably to, which type of approach is likely to be counter-productive; in his teaching he will be guided accordingly.

From : The Teaching of Pronunciation
by Peter Mac Carthy
Published by : Cambridge University Press

MAKING DO—SOME THOUGHTS ON HISTORY TEACHING

Bernard Shaw, it was, who once remarked trenchantly "those who can do something else; those who can't teach". Like all generalizations it has a kernel of truth and never more when applied to the teaching of History. Today even the most backward teacher education courses take cognizance of the special skills needed to teach Maths, Science or Languages, but everywhere the unspoken assumption about History is that anyone can teach it. At the risk of generalizing I would say that History is among the most poorly taught of school subjects. Harassed teachers oppressed by a demanding syllabus and a heavy teaching load often point out the lack of maps, aids etc. to excuse uninspired teaching. It is my contention that given the paucity of facilities in most schools such paraphernalia need not be necessary; any teacher who takes a little trouble can "make do" as it were. What follows is merely a series of stray suggestions gleaned from my own experiences as a working teacher.

First, the blackboard. For too many of us this is an unnecessary, even useless adjunct in the classroom situation except to write a name or a date. I cannot overemphasize the importance of blackboard summaries: these may develop the muscles of the teacher's writing arm and use up a good deal of chalk but they have several advantages: such a summary done while the lesson is in progress gives the sense of a lesson unfolding more than nice exposition by the teacher. A summary done after the lesson and with the points elicited from the pupils helps to develop an orderly mind and logical thought processes, absolute pre-requisites for the study of History.

Moreover since a great part of the senior school syllabus covers Indian history a sketch map is not beyond the skill of any teacher. Thus a basic map which includes the Ganges, Jamuna and Indus-Sutlej systems is more than sufficient to explain major political events and also imparts a certain geographical perspective. In this

connection C. C. Davies' map book is a great help for teachers too shy to try and draw a sketch map.

Regarding the structure of the lesson, it invariably means rows of passive students and exposition by a teacher. While I am not denying the importance of exposition, a little leavening of this boring formula by the Socratic question and answer method works wonders. An entire lesson can be worked out either through questions on a cyclostyled worksheet or asked orally in class. To give a concrete example: it takes no time at all to make 4 site plans of 4 Harappan sites, say Mohenjodaro, Harappa, Lothal, Kalibangan. These could be shown to the pupils and a series of questions asked: (1) What do you notice about the layout of the cities? What common features do they have? (2) What is the relation of wind direction and road layout? (3) How can we tell that residential areas were distinct from administrative areas? (4) What do the Granary and the Dock tell us about their economy? Similarly a brief sketch map can be drawn on the board and the main sites located and the pupils could be asked (5) why is the term Indus Valley Civilization a misnomer? The question and answer method used creatively and not merely to take up revision will do much to dispel from the pupil's minds the notion of history as mere swotting.

Even exposition can be made creative, if the pupils can share with the teacher the sense of history as a voyage of discovery. Again a concrete example: Ashoka mentions the names of certain kings to whom he sent missions of "Dhamma"—Amitiyoka, Yoaraja, Tulamaya, Antekina, Maka, Alikyashudala. It is not necessary for school students to remember these names but both teacher and student can have some fun. The first name is easy to decipher: the teacher can ask whether Maurya kings had relations with foreign rulers. By this time the class surely knows that both Chandragupta and

Bindusara had cordial relations with the Seleukid dynasty one of which was Antiochus and immediately the connexion is made. "Yonaraja"—the pupils should know that the Indian name for the Greeks was Yon or Yavana-translates immediately as "king of the Greeks." And so for Tulamaya, Ptolemy of Egypt. Even two of the above names will be sufficient to give the sense of a living, breathing king sending embassies to foreign countries, of which they need but know the regions concerned. Or a teacher explaining the cultural ferment under the Guptas can physically demonstrate the superiority of decimal notation over the Roman system for advanced mathematics. An extract from Shakuntala, either read or dramatized, will bring a sense of pleasure and discovery. Even that staple of childhood reading the Amar Chitra Katha can be used to great effect here.

For those senior school teachers who must teach a substantial chunk of cultural history including architectural styles, temples and monuments, help is surely at hand in the splendid series of pictures produced by Oxford University Press. For such lessons could be purely visual. Here I very often turn my class away from the blackboard and face the notice board instead. With a visual stimulus what better opportunity for the Socratic question and answer method! Again since the pictures are not very large, why not break up the formal classroom situation and

bring the pupils closer in a more informal group? Better still, obtain five sets of pictures and then to distribute them to five class groups before proceeding with the lesson. Neither will strain the finances or the discipline of the school.

There are very simple expedients which I have used in my own teaching and I hope I can say they have yielded results. Beyond this, it would be out of place to advise anyone. But a few general observations would not be out of place here. It is very important for a teacher of history to be on the alert for anything that might help the process of "making do"—magazine articles, pictures stuck on any available surface to make workcards, and historical films like Shatranj Ke Khilari for instance. In this connection I must mention the immense assistance that I get from the India magazine—from articles on Fatehpur Sikri to excerpts from Kalidas and the Rig Veda. To photocopy these costs little by way of time and money. Finally it must be said that even simple 'chalk and talk' can make a lesson come alive if the teacher has an inner sense of continuity with the present so that history is not the dead past but a bridge to the living present, to show how many of the simplest aspects of daily life from Classical music to Mughlai food have a historical dimension.

—Dayita Datta

[Reproduced with permission from the November 1985 Teacher Talk, the magazine of the Teacher's Centre, 7 Middleton Row, Calcutta-700 075.]

- * The real tragedy of life is not being limited to one talent, but the failure to use the talent.
- * Students are not crossword puzzles to be figured out, but students are people to be loved.
- * Treat people as if they are what they ought to be and you help them to become what they are capable of being.

PROBLEM—SOLVING

In an earlier issue of PATHWAYS, (August 1984), I had tried to suggest a variety of ways in which questioning, particularly in science, could be made more interesting and meaningful. Re-reading that article and thinking about the whole process of questioning, leaves me with a big doubt in my mind. Are we doing anything to improve the problem-solving skills of our students? Do we test them only on the content of their lessons? Do we make them apply that knowledge to situations they might face in their lives? How can we frame questions that make them think about applying the scientific concepts learnt in the classroom?

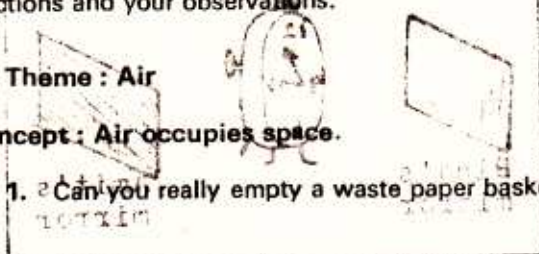
Most of my colleagues will probably say that it is next to impossible to frame that kind of question for children of the primary and middle school. It is certainly not easy! It needs a great deal of thinking on our part for the questions have to deal with situations with which young children are reasonably acquainted. I would once again stress here, the value of describing the problem in terms of a real-life situation, where the people involved are children with familiar names. Pictures too can help in posing these questions.

For this article, I have compiled some questions which might interest readers. I am sure some of you would like to try them out with your students. Please do write and let me have their reactions and your observations.

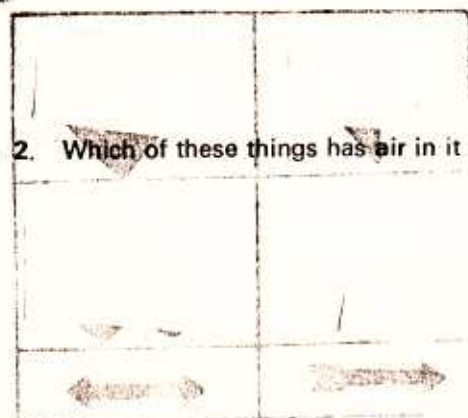
A : Theme : Air

Concept : Air occupies space.

Q. 1. Can you really empty a waste paper basket completely? What does "empty" mean?

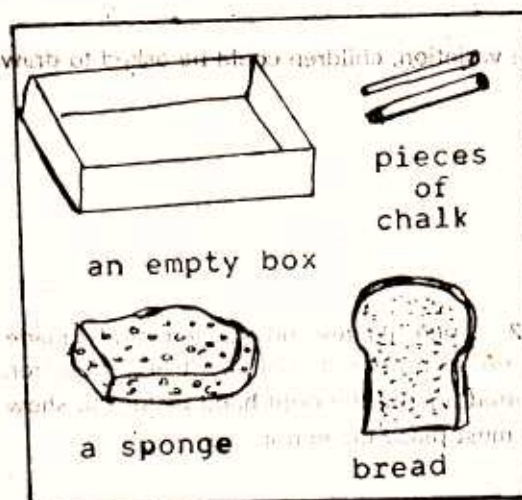


Q. 2. Which of these things has air in it?



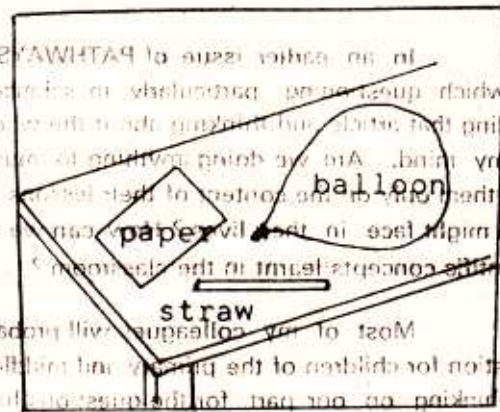
Concept : Air can exert a "push" (air pressure).

Q. 1. Four girls sit around a table. In the centre of the table there is a balloon. Each girl has to try and blow the balloon away from herself. How can they keep the balloon from being blown off the table?



This question could be tried as a practical exercise. The children will have great fun trying to keep the balloon on the table.

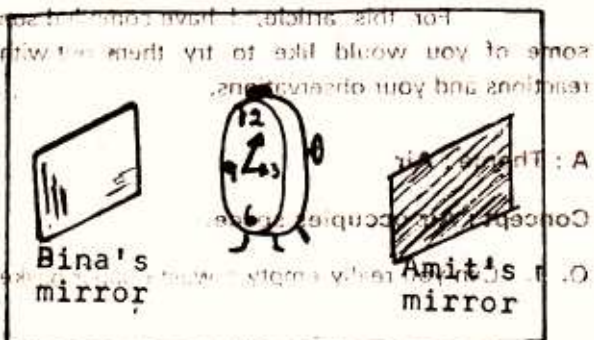
Q. 2. A balloon, a drinking straw and a piece of paper are placed on a table. How will you use one of the other things to move the piece of paper?



Q. 3. Suppose you had a huge bag—the world's biggest plastic bag. It is made of tough strong plastic. How could you use it to lift an elephant off the ground? Draw a picture to show how this might happen.

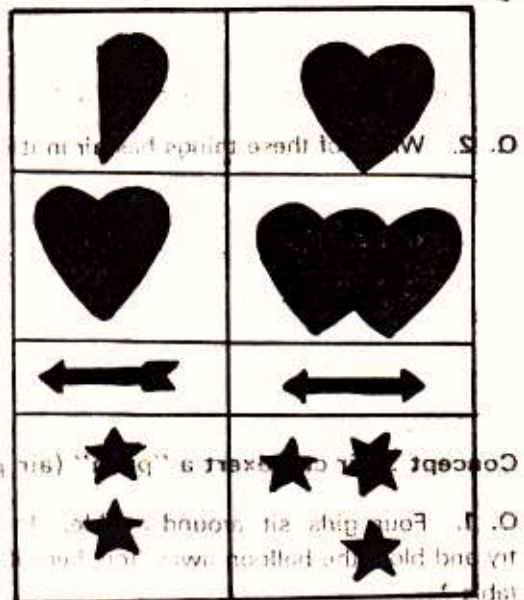
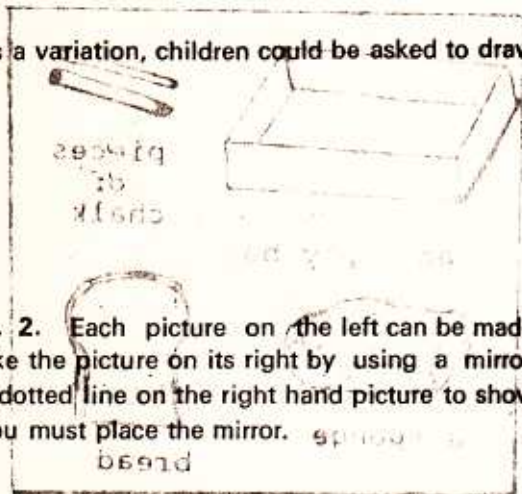
Theme : Mirrors and Reflections

Q. 1. Amit and Bina are each holding a mirror. Which sides of the clock can each of them see?



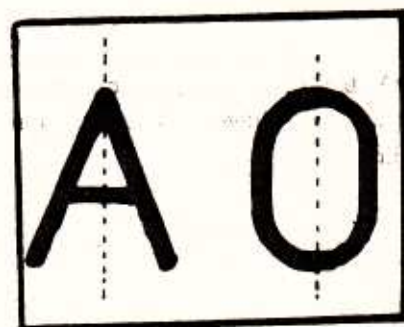
As a variation, children could be asked to draw their answers.

Q. 2. Each picture on the left can be made to look like the picture on its right by using a mirror. Draw a dotted line on the right hand picture to show where you must place the mirror.



Readers would notice that it is possible to make this question both interesting and thought-provoking. Obviously the best way of presenting the problem to the class would be to hand out a sheet of paper with these drawings. Copy them on to a stencil and make as many copies as you need. If you want to make things easier for the students, let them actually try out the exercise with a small hand mirror. Primary children could do this before drawing the line of the mirror on the pictures. Middle school and senior children might perhaps be expected to "think it out" in their heads.

Q. 3. 'A' and 'O' are two letters of the alphabet which have "look-alike" halves. If you place a mirror on them as shown in the picture you can make a full letter out of a half-letter. Which other letters have to look-alike halves? In each case draw a dotted line to show how you must place the mirror.



This problem may also perhaps be tackled at first, through a practical exercise.

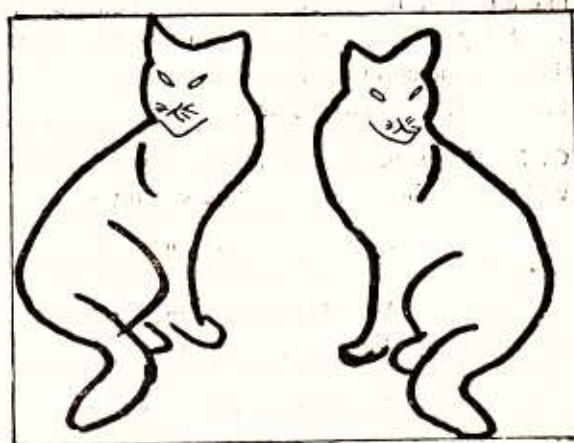
Older children who have learnt about lateral inversion, might be asked this question:

Q. 4. 'U' and 'I' are letters which look the same when seen in a mirror. How will you find out if they are laterally inverted or not?

For readers who can't think this one out, the answer is at the end of the article.

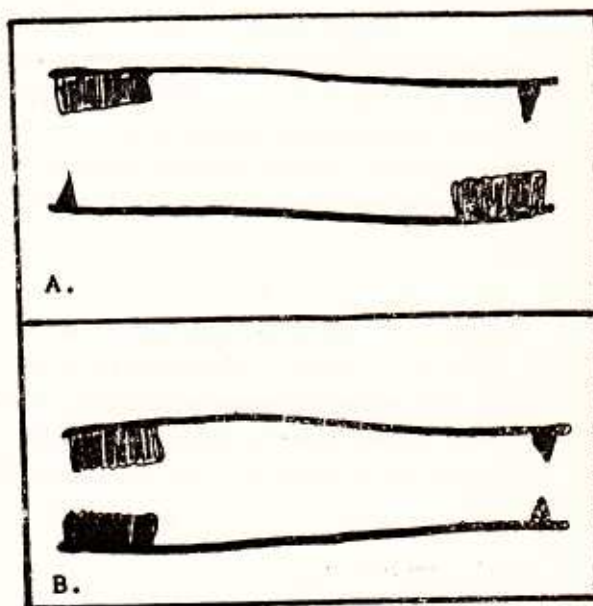
Mathematics teachers would, I'm sure, be delighted to take this opportunity of extending the idea of symmetry and mirror images to the concept of congruence. Practical exercise using common geometrical figures like rectangles, squares and triangles must first be used to explain the idea of congruence. When the children have understood, try these questions.

Q. 5. Can a figure that has two shapes in it have a line of symmetry? Are the two shapes congruent?



Let children have the experience of drawing other pairs of shapes to explore this idea further.

Q. 6. Are these pairs of figures congruent? Do they also have a line of symmetry? Draw this line?



Theme : Measurements

Too often children associate the measurement of length with using rulers to measure lines drawn in a book. Enterprising teachers, no doubt, ask them to measure objects. Why not add if a little more interest to the exercise? Try it practically if you prefer. No clues to the answer for readers!

Q. 1. You are given a ruler, two bricks and a football. How will you use these to measure the width of the football.

Q. 2. You are given a piece of chalk, a cycle wheel and a piece of string. How will you use these to measure the length of a veranda?

Perhaps you have introduced the idea that distances can be measured in non-standard units like a pace, a handspan or a piece of string. This must have led children to realise that using parts of the body is not a good measurement idea, as people are of different sizes. What about the paces of the same person? Can he always use them as a fair comparison in measuring under different circumstances? Here is the problem.

Q. 2. A 'pace' is the length of your step when you walk on level ground. Do you think your pace will remain the same or change when you.

- i. walk up a steep hill
- ii. walk down that hill
- iii. jog on level ground
- iv. run on level ground?

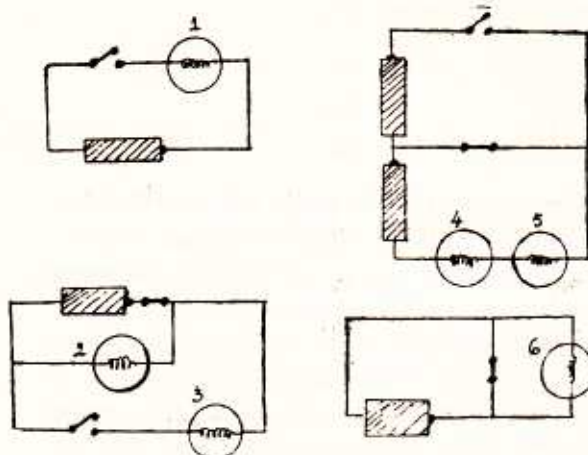
How will it change?

Theme : Electric Circuits

Concept : A bulb in an electric circuit will only light up when the circuit is complete.

Q. 1. All the bulbs in these circuits are alike, Each bulb will light up brightly when connected to only one cell. What would you do to make each bulb light up :

- i. nothing; ii. close a switch; iii. open a switch; iv. close one switch and open another.



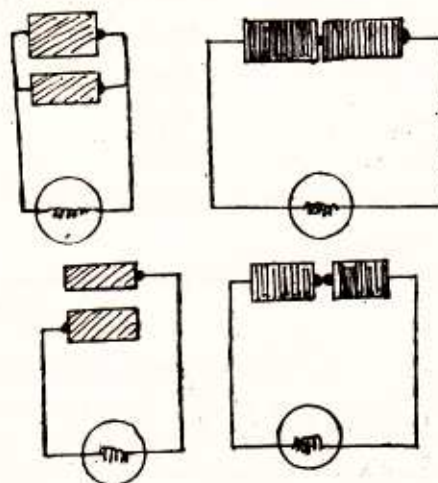
Concept : Cells may be connected in series or in parallel

Q. 2. The drawings show you several ways of connecting a bulb to two cells. In each case predict what the bulb will do. Will it :

- i. light brightly; ii. light less brightly; iii. not light at all.

In which drawings are the cells.

- i. connected in series ? ii. connected in parallel ?
iii. not connected at all ? iv. not connected correctly ?



Here are two further problems :

Q. 3- Car headlights can be switched on to give either very bright light or medium bright light—How many filaments do you suppose there are inside a car headlight ?

A light bulb sends out rays of light in all directions—to the front, to the sides and to the back. Can you think how most of the light from the bulb can be made to light up the road, without its going waste ?

Q. 4. Suppose you had two different brands of torch cells. How would you find out which one which one would last longer in a torch. How can you make sure that your test is a fair one ?

The concepts of ecology which form an important part of the life sciences syllabus also lend themselves to questions of this type. Problem solving in biology will make it an interesting subject, an exercise for the mind—rather than a collection of facts to be remembered. More about this in the next issue of PATHWAYS.

P. S. : I almost forgot to give you the answer to the question on mirrors ! Put a tiny dot on one side of the letter and then look at its mirror image.

—Gayatri Moorthy

Guess My Word

Here is a two-person game that proves mathematics is everywhere, even in words. Here's how the game is played. One of the two persons thinks of a word—a three letter word for starters. The other gets to guess it. Their first attempts might go like this.

Box ?	No.
Pie ?	No.
Cap ?	No.

Obviously a random guess will not do. They must play with rules. When one person makes a guess, the other has to tell whether the guess comes before or after the real word in the alphabet. That way the game has some strategy to it; it is not just helter-skelter guessing. It is alright for the guesser to use paper and pencil and keep track of the guesses. Now they try again. And the guesser tries to guess the other person's word in as few guesses as possible.

Mop ?	After
Dog ?	After
Cat ?	After
Bat ?	Before

Okay, how about "Big" ?
That's it !!

To play this game well requires some mathematical thinking. The first guess is an important one. If you're thinking mathematically, then a first guess such as "mom" or "nap" is generally better than one such as "yes" or "aim". Can you think why this is so ?

How many three-letter words do you think there are in the English language ? If you could put any of the 26 letters of the alphabet together to make a three-letter word, there are a lot of arrangements possible, 17576 to be exact.

Mathematicians call these "permutations". However, some of those permutations aren't words in English—"glp", "rux" and "phu" for example. It would be safe to say that there are fewer than 17,576 three-letter words in the English language.

If this game is too easy with three-letter words, try it with four-letter words instead. Or five-letter words. There are more permutations of four and five-letter words, so if you use them, the game should be even more difficult.

SCHOOL LOAN KITS

The National Museum of Natural History, Delhi, has announced in its newsletter that it has developed special Loan Kits for Schools. These curriculum oriented kits, meant to serve as visual aid in class room teaching, will now be available on loan basis to schools. Those interested in taking advantage of this facility or requiring further information are requested to get in touch with the Senior Educational Assistant, Division of Education, NMNH, Barakhamba Road, New Delhi. Tel. 331-4849.

The Loan Kits are available on the following themes :

- | | |
|-----------------|----------------------------------|
| 1. Termites | 6. Protozoa |
| 2. Food chain | 7. Modification of leaves |
| 3. Solar system | 8. Molluscs |
| 4. Silk worm | 9. Economic importance of Plants |
| 5. Honey Bee | 10. Echinoderms. |

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